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ABSTRACT

This curriculum guide for teaching about blood donation was prepared to improve school-community participation in the New York City Blood Donor Program. It contains plans for five lessons on the following topics: (1) the nature of blood; (2) blood and technology--modern-day advances; (3) blood and your personal health; (4) the blood donor as good citizen; and (5) increasing blood donations. Each lesson contains background notes for the teacher. Teaching strategies are broken into steps that are organized according to performance objectives, materials necessary, development of topic, and summary; and include student worksheets. The materials in this guide are useful in several subject areas, such as health education, health careers, and social studies. (PS)

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YOU... AS BLOOD DONOR

Teacher Strategies and Student Worksheets

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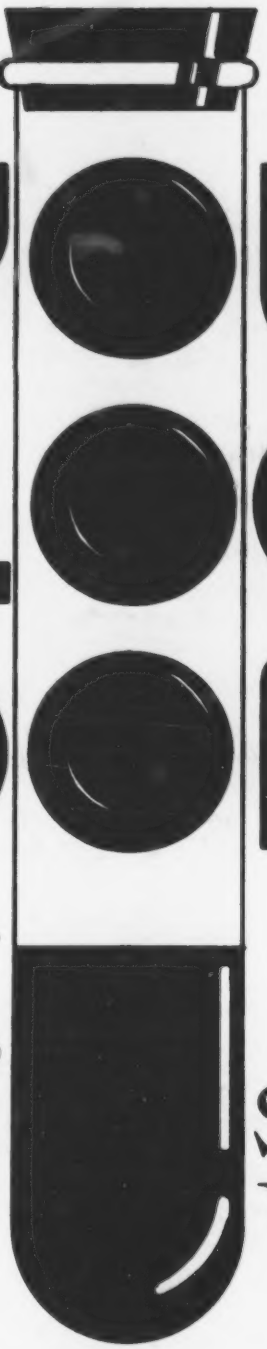

Teacher Strategies and Student Worksheets

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Foreword

The Division of Curriculum and Instruction in cooperation with the Greater New York Blood Program has prepared *You . . . as Blood Donor* in an effort to improve school-community participation in the New York City Blood Donor Program. We share the concern of the Greater New York Blood Program and the medical community over the decline in blood donations that is creating a serious shortage of blood in our hospitals. Blood donations are essential to save the lives of accident victims and patients with certain chronic diseases.

The materials in this booklet may be used in several different subject areas, such as health education, health careers, and social studies, or may serve as a framework for organizing and promoting a school-wide blood donation effort. The civic responsibility of students to donate blood to community blood programs in order to maintain an adequate supply for all hospital patients is emphasized. The guide also makes clear to young people that there is nothing to risk, and a great deal to gain by donating blood, that giving blood costs us nothing financially, and can mean the gift of life itself for others.

Charlotte Frank

Charlotte Frank
Executive Director
Division of Curriculum and Instruction

Acknowledgments

This curriculum guide, *You . . . as Blood Donor,* is a project of the Division of Curriculum and Instruction, Charlotte Frank, Executive Director, in cooperation with the Greater New York Blood Program. Dr. Viljayalaxmi Malavadi is Director of the New York Blood Services.

Edward Aquilone, Executive Director of the Division of Personnel, was appointed as campaign director to coordinate the efforts of the Board of Education and the Greater New York Blood Program. He has been assisted by Dr. Salvatore Grande.

Morris Freedman, Director of the Office of Curriculum Development and Support, provided overall supervision, and Sylvia Schechter, Director of Health and Physical Education, was directly involved in the planning and ongoing review of the manuscript.

Writers of the guide were: Diane Zagare Degroat, Assistant Principal, Special Education, Grover Cleveland High School, Maureen Maguire, Production Coordinator, Curriculum Editorial Production Unit, who also designed the book, Edith Novod, Curriculum Specialist in Communication Arts, and Melvin Warren, Assistant Director, Health and Physical Education.

Anthony Galitsis, Director, and John Kominski, Assistant Director, of the Science Unit, reviewed the materials for scientific accuracy.

Members of the Greater New York Blood Program who offered advice, creative input, and assistance were:

- Joseph Benincasa, Director of Public Education.
- John Butler, Associate Director, Donor Resource Development.
- Robert L. Hirsch, M.D., Medical Director.

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The manuscript was produced by the staff of the Curriculum Editorial and Production Unit, Alaire Mitchell, Unit Head: Typesetting, Billye Timbes, copyediting, Ray Norberto; and cover design, John Gampert.

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LESSON 1:

The Nature of Blood

Some Background Notes for the Teacher

HOW BLOOD IS BROKEN DOWN

Blood Blood accounts for 8% of the total body weight. It transports oxygen, water, and nutrients to the body. About 55% of the blood consists of a straw-colored liquid portion called plasma. The other 45% is a solid portion composed of red blood cells (44%), white blood cells, and platelets (0.5%). Red blood cells, white blood cells, and platelets are produced in the bone marrow. There are four types of blood: A, B, AB, and O.

Red blood cells are the most numerous and smallest of the blood cells. Hemoglobin is a pigment found in the red blood cells; it is responsible for carrying oxygen to the cells in the body. Oxygenated hemoglobin is bright red; deoxygenated hemoglobin is dark red. Red blood cells have an average life span of 120 days.

White blood cells protect the body from foreign proteins or organisms. Certain types of white blood cells produce antibodies which neutralize bacterial organisms or their poisons.

Platelets are involved in the complex blood-clotting mechanism. They play an important role in the prevention of bleeding.

Plasma is the liquid portion of the blood. Plasma is more than 90% water, and 7% is a complex mixture of proteins. The remainder of plasma is composed of salts, enzymes, hormones, vitamins, and waste products from other cells. Glucose is the most important nutrient in blood plasma and is commonly called blood sugar. It is the major source of fuel in carrying out metabolic processes.

Hemorrhage is severe, excessive bleeding. Severe bleeding from any large cut may be fatal in a very few minutes. Bleeding should be stopped quickly by applying direct pressure to the wound. It takes approximately 24 hours for the body to restore the fluid portion of the blood when one pint of blood has been lost rapidly.

Rh factor: is a protein on the surface of red blood cells. It was first discovered in the blood of the rhesus monkey, hence the Rh. An Rh positive individual (Rh+) has the protein in red blood cells, while an Rh negative individual (Rh−) does not. Eighty-five percent of Caucasians and over 95% of the nonwhite population have the protein. The Rh factor is genetically controlled: the gene for Rh positive is dominant over the gene for Rh negative. If you are Rh negative, you do not have the Rh factor in your blood. If you are Rh positive, you can receive Rh positive or negative blood. If you are Rh negative, and are given Rh positive blood, your body may react by making an antibody against the Rh factor. If you receive Rh positive blood again, at some other time, the antibody will react against it and help to destroy the transfused cells.

HOW BLOOD CIRCULATES

Dark, bluish blood lacking oxygen enters the upper chamber of the right side of the heart from the superior and inferior *venae cavae* (the plural of *vena cava*). *It flows through a valve to the lower chamber. From the lower chamber, it is pumped out of the heart though an artery to the lungs. In the lungs, the blood gets rid of carbon dioxide and picks up oxygen. The newly oxygenated blood is bright red. The blood returns to the upper chamber of the left side of the heart. It passes through a valve to the lower chamber of the heart where it is pumped to the body.*

HOW CIRCULATION WAS DISCOVERED

Although William Harvey of England is generally credited with the discovery of the circulatory system, there were many pertinent earlier observations.

An Egyptian Pharoah in 4000 B.C. recorded that the circulatory system consisted of the heart and twelve principal vessels proceeding from the heart and extending to the body and limbs.

A more concise illustration of the circulatory system was recorded by Chinese Emperor Hwang Ti in 2500 B.C.: "All the blood is under the control of the heart. The heart regulates all the blood of the body. The blood current flows continuously in a circle and never stops. It may be compared to a circle without beginning and without end." Although this description was rather general, it was more accurate than others written as late as the 15th century A.D. and preceded Harvey's discovery of the circulatory system by 42 centuries!

Galen, a Roman physician who treated gladiators, believed that there was dark red blood in the right side of the heart which came from the liver with added "natural spirits," and that bright red blood in the left side of the heart received its "vital spirits" from the lungs. All blood, he wrote, sloshed through a wall which separated the right and left sides of the heart, flowing throughout the body as needed to feed the soul. Galen's major discovery was that the arteries carry blood, contrary to the belief then that the arteries carried only air.

Based on a 20-year study of the circulatory system, William Harvey published a controversial paper in 1628, demonstrating that blood flowed in two circles, one from the heart through the body and back to the heart, and the other from the heart to the lungs and back to the heart. He also explained that blood left the heart in the arteries and returned to the heart in the veins. He stated that blood only flowed in one direction. He failed, however, to explain how blood traveled from the arteries to the veins. Demonstration of this phenomenon was made in 1661 by an Italian named Marcello Malpighi. He used a primitive microscope to show that arteries are connected to veins by a very tiny network of blood vessels which he named capillaries.

BLOOD TYPES

Human blood falls into four major classes or blood types: A, B, AB, and O. Although percentages of each blood type vary among different groups of people (whites, blacks, orientals, Eskimos), tests indicate that about 45% of the world's population has type O, 42% type A, 10% type B, and 3% type AB. The same types of blood are found in both sexes and in all human races. Before a patient is given a whole-blood transfusion, the blood must be typed. When the type is determined, a donor's blood of the same type is used in the transfusion. If a wrong blood type is given, the blood cells in the donated blood clump together. When this happens, the person receiving the new blood becomes very ill.

The Rh factor must also be considered in matching blood. If Rh positive blood enters the bloodstream of a person with Rh negative blood during a transfusion, antibodies are produced. Rh negative blood containing Rh antibodies has a severe effect on the red blood cells of Rh positive blood. It causes them to clump and gradually destroys them.

The most life-threatening instance of Rh incompatibility has long been that of a second incompatible child carried by an Rh negative mother who had been sensitized during a preceding pregnancy.

TEACHING STRATEGIES

Step One: Your Blood I.Q.

Performance Objectives: The students will be able to:

- *test themselves on a blood quiz*
- *rate themselves on their own knowledge of blood*

Materials: Duplicated copies of student worksheet I-A, "What is your blood I.Q.?" as well as copies of self-rating sheet.

Development: One thing we all have in common is blood coursing through our veins. We all know that it's red and it circulates. But how much else do we know? What words come to mind when you think of blood. (Using a semantic map on the chalkboard, brainstorm how much the class really knows about blood.)

Distribute quiz. Make sure that students understand that this is not a quiz being used for a grade, but simply a diagnostic tool for self-evaluation. Explain any vocabulary items which students do not understand; refer to teacher background notes for help in phrasing explanations.

When all students have finished the quiz, distribute the student self-rating sheet (I-A)).

Student Worksheet 1-A

What Is Your Blood I.Q.?

Directions: Circle "T" if the answer is true. Circle "F" if the answer is false. Circle "?" if you really don't know the answer.

1. T F ? Blood transports oxygen, water, and nutrients to the body.
2. T F ? Blood is bright red when it contains oxygen.
3. T F ? Blood makes up about 8% of the body weight.
4. T F ? Blood can be separated into two portions: plasma and blood cells.
5. T F ? Blood contains red blood cells, white blood cells, and platelets.
6. T F ? Hemoglobin is a pigment found in the red blood cells that is the carrier of oxygen.
7. T F ? Red blood cells develop in the bone marrow.
8. T F ? Red blood cells have an average life span of 120 days.
9. T F ? White blood cells help fight infection by producing antibodies.
10. T F ? The function of platelets is to initiate the clotting or coagulation process.
11. T F ? Plasma is the fluid portion of the blood.
12. T F ? Glucose is the most important nutrient in blood plasma and is commonly called blood sugar.
13. T F ? Antibodies are essential in the constant fight against infection.
14. T F ? Bleeding should be stopped quickly in order to prevent excess loss of blood and possible shock.
15. T F ? Hemorrhage is severe or excessive bleeding.
16. T F ? Within 24 hours after one pint of blood has been lost, the original fluid volume of blood has been restored.
17. T F ? There are four basic blood types: A, B, O, and AB.
18. T F ? If the red blood cell contains a protein substance, Rh factor, the person is said to be Rh+ ("Rh positive"). If the red blood cell does not contain the factor, the person is said to be Rh– ("Rh negative").
19. T F ? The average-sized adult has ten pints of blood.
20. T F ? Arteries carry blood away from the heart.

Rate yourself. How did you do on the quiz?

Score	*Rating*	*Explanation*
20	Excellent	This is not a quiz to be used as a grade. It is a tool for self-evaluation and improvement. A low score indicates that there are things to learn and understand before you give blood.
15-19	Very Good	
10-14	Average	
5-9	Below Average	
0-4	Limited	

(All of the answers are true!)

Step Two: Dispelling the Myths

Performance Objectives: The students will be able to:

- *participate in a discussion of historical myths associated with blood*
- *contribute incidents from their own experiences and readings to support historical misconceptions about blood*

Materials: Duplicated copies of student worksheet I-B, "Myths about Blood."

Development: From earliest times people were aware that blood was in some way very special and necessary for life.

Distribute worksheet I-B, "Myths about Blood." After students have read the worksheet, use these discussion points.

- What was blood used for in farming?
- What did some people think would happen if they drank the blood of certain animals? For instance?
- What magical powers was blood thought to possess?
- Why was the color red used in early times? In medicines today?
- The word "blood" frequently appears in expressions. Give some examples and what they mean.
- What special attribute was given to blood in the 16th century?

As the discussion warms up, ask students to contribute myths about blood from their own family background, from stories they have read, or from films or TV programs they have seen. Make a list of these class-generated myths on the chalkboard. Some samples might be:

- Getting a blood transfusion from a smart person will make you smart.
- The color of your blood is determined by your skin color.
- A person could get AIDS from giving blood.

Summary: Knowledge is the best way to dispel silly myths. Scientists understand the composition of blood, how it circulates, and how it can be tranfused to save lives. There is no room for primitive myths in the world of modern blood technology. We are now ready to "learn the facts."

Myths about Blood

Through the centuries, blood has fascinated and awed people. Early myths about blood became a basis for sacrificial religious ceremonies, medical practices, and even poetry.

Primitive people were aware than an animal soon died after losing a large amount of blood, and therefore equated blood with life.

Since blood was believed to contain a life force, it was even used as a fertilizer for crops. In addition, human subjects were sometimes sacrificed to influence weather conditions.

In some cultures, drinking the blood of certain animals allegedly endowed the drinker with the animals' characteristics. Lion's blood, for example, was thought to give people strength and courage.

Red, the color of blood, was thought to have magical powers. CroMagnon people painted the sick and dead red, hoping to contain the life force. Early Egyptians painted their bodies with blood to ward off sickness. Later, pastes and dyes were substituted in the practice—a forerunner of makeup.

In early England, red coverings were put on beds to treat smallpox, and strips of red cloth were used as cures for scarlet fever. Even today, many pills and medications are colored red, although this coloration has no medicinal value.

Among today's slang terms stemming from ancient beliefs about the blood is **blood brothers** from the myth that mixing blood of two people would bind them in friendship. **Blue-blooded,** a term denoting royalty, was originally used by nobles of Castile who imagined that they could see the "blue blood" through their veins.

Other familiar terms include **hot-blooded** (easily flies into a rage), **cold-blooded** (cold and calculating) and **blood bath,** which comes from an ancient Egyptian practice of bathing kings in blood from sacrificed human subjects to cure leprosy.

During the 16th and 17th centuries, it was believed that sickness could be transferred from a patient to a "sympathetic object." For example, an egg would be emptied of its contents, filled with blood from a healthy human and returned to a brooding hen. When needed by a patient, the egg was heated in a hot oven for several hours and then held over the affected part of the diseased body. The sickness allegedly left the body of the patient and entered the egg, preferring the healthy blood in the egg to the diseased blood in the patient.

Although these ancient beliefs about blood have for the most part disappeared, some still remain to frustrate modern medical procedures. In certain rural areas, taking blood samples is forbidden because it is believed that vital spirits needed to keep the body alive might be removed with the blood. Another primitive belief retained by some is that blood cannot be replaced once it is removed from the body. There are actually adult males here in the United States who believe that giving blood will decrease their sexual drive.

Adapted from Eloise R. Giblett et al., *A Teacher's Guide to Blood Education* (Seattle: Puget Sound Blood Program) blue pp. 1-2.

Step Three: Learning the Facts

Performance Objectives: The students will be able to:

- *describe the flow of the circulatory system*
- *trace the path of blood*
- *recognize the importance of blood*
- *identify the components of blood*

Materials: Duplicated copies of student worksheet I-C "How Your Blood Circulates" and "Label the Diagram."

Development: Using background information on page 2, "How Circulation Was Discovered," motivate students to an interest in humankind's quest for knowledge about the circulatory system.

Distribute student worksheet I-C, "How Your Blood Circulates." If a classroom chart of the circulatory system is available, ask one student to come to the chart with a pointer and trace the path of the blood as another reads the passage aloud.

Use the following questions for discussion:

> What three functions does blood perform as it circulates? (bringing nutrition, removing poisonous wastes, and fighting infection.)
>
> How would it affect your life if your blood did not circulate properly?

Now ask students to label the diagram which follows the reading showing the vital parts of the circulatory system and roughly tracing the path of circulation.

Summary: Ask students to look back at their "Blood I.Q." quiz and look at any items they had marked "false" or "I don't know." Survey class informally to see if participants are more aware of the nature of blood.

Student Worksheet 1-C

How Your Blood Circulates

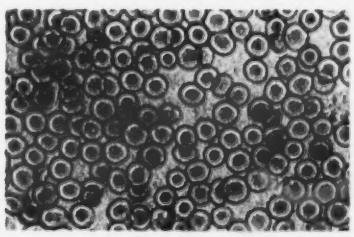
There are trillions of cells in your body. They all depend for survival on your circulatory system, which carries nourishment to your cells, takes away poisonous cell wastes, and protects your whole body from harmful microorganisms.

Let's follow the path of some blood as it goes through your body. Let's start at the point where your blood enters the upper right side of your heart through the vena cava. It is, at this point, tired blood having returned from its long journey; it is oxygen poor. The blood is pushed out from the heart through the pulmonary artery and moves to the capillaries in the lungs where oxygen is diffused in and carbon dioxide is diffused out. Now the blood is oxygen rich again and raring to go. Now it enters the heart again through the pulmonary vein, from which it is pushed into the aorta, the largest artery in your body. From here the blood branches out through arteries and capillaries, where its work of providing nourishment and taking away wastes is done. Now the blood is ready to go back to where it started, to the vena cava, for the revitalizing process.

During all this organized running around, blood tissue picks up nutrients in your small intestine and oxygen in your lungs. It moves both of these materials to your cells. The wastes made by your cells also enter your blood. The blood carries these wastes to your kidneys, skin, and lungs — from which they are removed. *

Your blood contains three types of cells or cell parts. **Red blood cells** carry oxygen to your cells. These cells have no nuclei, but they contain a red protein called **hemoglobin.** As red blood cells pass through your lungs, the hemoglobin picks up oxygen. The red blood cells carry the oxygen near all of your cells. The hemoglobin then gives up its hold, and the oxygen enters your cells.

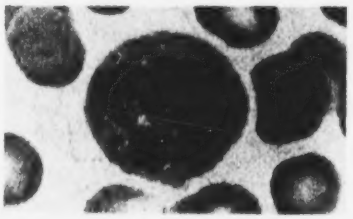
Focus on the shape of red blood cells in the drawing below. Billions of these disclike red blood cells live inside you. Your bone marrow constantly makes new red blood cells. They have a life span of 120 days.



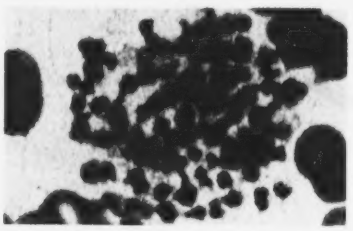
*Freely adapted from McLaren et al., *Spaceship Earth: Life Science,* Houghton Mifflen, 1981).

Student Worksheet 1-C (continued)

White blood cells defend your body as they fight off harmful microorganisms and eat up dead cells. Observe that the different kinds of white blood cells are colorless and have a nucleus. In general, there is only one white blood cell for every 650 red blood cells. New white blood cells are also made in your bone marrow and in clumps of special tissue called **lymph nodes.**



Platelets start the clotting of blood. Platelets are only parts of cells and as you see, they are smaller than red and white blood cells. Platelets live about ten days and are made in your bone marrow.



Suppose you cut your finger. As the blood escapes, platelets stick to the jagged edges of the broken blood vessels. A complex series of steps soon begins.

The fragile platelets pile up and break apart. Chemicals from the broken platelets and chemicals made by the damaged blood vessels trigger the growth of a threadlike protein called **fibrin.** Notice in the picture below that fibrin is forming a net around a red blood cell. As fibrin traps more cells, a clot forms. The clot seals off the damaged blood vessel and stops the bleeding. As the blood dries, the clot makes a hard protecive scab. If this process did *not* take the place, you could bleed to death from a cut finger.*

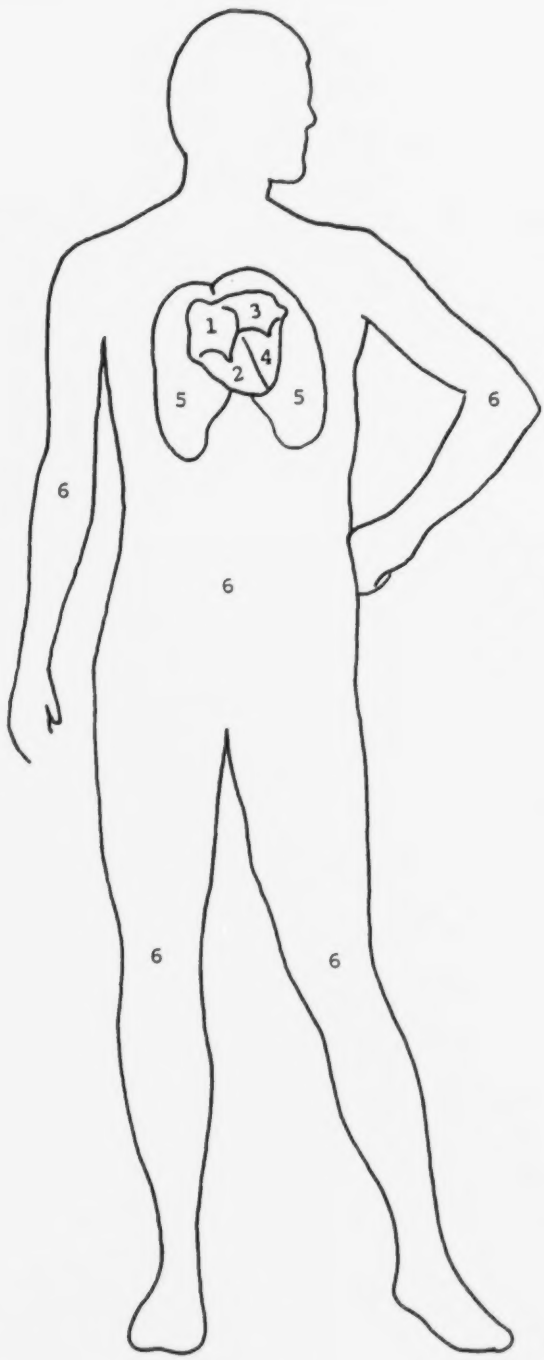
Red blood cell trapped in a net of fibrin

*From LeVon Balzer et al., *Life Science* (Glenview: Scott, Foresman and Co., 1983) p. 273.

LABEL THE DIAGRAM

Using the diagram, label each numbered body part. Briefly trace the path of the blood from the heart, through the body, and back to the heart.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____



LESSON 2:

Blood and Technology
Modern-day Advances

Some Background Notes for the Teacher

Your students have grown up in a society which takes blood transfusion for granted. And yet, historically speaking, the development of the technology for taking blood from a donor and giving it safely to the patient in need is quite new.

In order to give your students some concept of the historical perspective, you might have them read the little history of transfusion in student worksheet 2-A. From here, you can go on to explain the many steps involved in processing donated blood (a topic which might motivate some serious career planning for some students). You are then provided with a reading about an outstanding black surgeon who developed the technique of blood banking.

For those who wonder just how far technology can go (after all, this is the year when a man did live for some months with an artificial heart), you may introduce the idea of artificial blood, always making clear that there is no substitute for the blood of healthy donors.

TEACHING STRATEGIES

Step One: A History of Transfusion

Performance Objectives: The students will be able to:

- *identify situations in which blood transfusions save lives*
- *participate in a discussion of the advances in blood transfusion over 300 years*

Development: Inquire of the class how many students have had any personal experience with blood transfusions. (Almost every family has had a situation wherein someone has had an operation or a health-endangering situation requiring a transfusion.) Be sensitive to the possibility of students who come from religious backgrounds which may forbid blood transfusions.

Ask students to relate the need for blood transfusions to medical plots they have seen in movies or on television. (There should arise some anecdotes where the blood supply was diminished, as on *M*A*S*H*, or where the right kind of blood was not available, as on *St. Elsewhere*.

Ask students to estimate how long modern methods of blood transfusion have been in practice.

Distribute student worksheet 2-A, and ask class to read silently. Then use these questions as a springboard for discussion.

- Do you think the Paris Society of Physicians was right to declare transfusions illegal in 1687? Why or why not?

- Based on your earlier reading about the nature of blood, why do you think it clotted before it could get to the veins of the recipient?

- Why is Karl Landsteiner so important in the history of blood transfusions?

- If you donate blood, is it likely that all of your blood will go to one patient? Point out the lines in the reading which answer this question.

Student Worksheet 2-A

A History of Blood Transfusion

Sometimes an injury is so severe that normal clotting is not fast enough to stop the bleeding. This can be dangerous, because people die when they lose 40 percent or more of their blood. Today, the blood they need can be replaced. The process of taking blood from one person and giving it to another is called a **transfusion.**

Early references to "transfusion" practices have been recorded as early as 43 B.C. when, according to legend, the witch Medea replaced all the blood from Jason's father with a magic brew. Wealthy Romans drank the blood of slain gladiators as a cure for epilepsy. Druids, then Anglo-Saxons, practiced blood-letting with leeches. This practice rarely had medical value, except in a patient whose circulation was overloaded with blood. Such blood-letters became known as "leeches."

In 1628, William Harvey demonstrated that blood circulates. The first transfusion from dog-to-dog was completed in England in 1665 by Richard Lower. Excited by the work of Harvey and others, Lower unsuccessfully tried to transfuse animal blood into a human in 1667. During this time, a French physician named Jean-Baptiste Denis transfused sheep's blood into a 15-year-old boy. The boy was allegedly "cured" and Denis went on to perform several more transfusions. At one point, he transfused a man who later died, and the widow sued Denis. After a considerable controversy, the Paris Society of Physicians in 1678 declared all transfusions illegal.

Other countries, such as England, soon followed suit, and transfusion was not practiced for some fifty years.

In 1818, a French physican named James Blundell wrote that species lines should not be crossed when transfusing blood. He performed the first human-to-human transfusion on a mother who had lost large quantities of blood during childbirth. A donor's artery was opened, the spurting blood was caught in a cup and sent through tubing inserted into the patient's vein. the amount transfused was estimated by timing. Usually the blood clotted in the tubing before it could get into the patient, probably a fortunate occurrence because of the high rate of blood group incompatibility. Blundell had some success with this type of transfusion, but animal blood was used into the 20th century.

It was realized that, to insure successful transfusions, drawn blood must not be exposed too long or it would clot. A variety of ingenious items used to increase the flow included stopcocks, valves, syringes, and quills.

At the turn of the 19th century, vein-to-vein transfusion was practiced by highly skilled surgeons, but the amount of blood being transfused could still be only estimated.

Adapted from Eloise R. Giblett et al., *A Teacher's Guide to Blood Education* (Seattle: Puget Sound Blood Program) blue pp. 3-4.

Some relief from this difficulty followed the discovery in 1911 that paraffin slowed the clotting process. A Y-shaped tube coated with wax was connected to a vein of the patient and one of the donor. A syringe was attached to this apparatus, and, by alternating the opening and closing of several valves, blood was transfused. Thus, the amount of blood being received by the patient could actually be measured for the first time.

Karl Landsteiner discovered blood groups in 1901. He investigated the reactions between the red cells and serum of the blood in 22 of his co-workers and found that the serum from some subjects clumped the red cells of certain other subjects. This observation eventually led to blood group classification in the ABO system known as O, A, B, or AB types.

In 1914, it was found that sodium citrate would keep the blood from clotting when added to donated blood. This permitted donated blood to be stored in a bottle for later transfusion.

During World War I, use of a citrate-glucose solution as preservative and anticoagulant was introduced by a Canadian Army medical officer. In 1943, British physicians found that by adding acid to a citrate-dextrose (sugar) solution, blood could be stored three weeks. After the war, this acid-citrate-dextrose (ACD) solution was widely accepted as the standard for 21-day preservation of blood in blood banks.

Several other important discoveries helped bring blood transfusion to its present-day standards. A second human blood group system, called Rh (for the Rhesus monkey), was discovered in 1943.

Recently, with the addition of adenine to CPD solution, the expiration date of whole blood and red cells was extended to 35 days. Adenine supplies the red cells with a sufficient source of energy to permit longer storage.

Today, one unit of whole blood can be separated into components which can be used to treat several patients with different blood needs. This practice of transfusing patients with components provides maximum efficiency for blood resources management.

Summary: Recap the importance of the history of blood transfusion by pointing out some of the diseases and conditions which require transfusion:

- leukemia
- hemophilia
- sickle cell anemia
- surgery
- severe burns

Step Two: The Importance of Blood Typing

Performance Objectives: The students will be able to:

- *interpret information given on a chart to discuss world distribution of various blood types*
- *explain why it is so important to have the blood types of donor and recipient be compatible*

Materials: Student Worksheet 2-B, "Why is Blood Typing Important?"

Development Say to students:

Every once in a while you read or hear about a person who is in dire need of blood or one of its components but who needs a special type of blood. Does this mean that:

- only the blood of the donor needs to be typed?
- only the blood of the recipient needs to be typed?
- both must be typed to see if they are compatible?

Why might it be possible to receive a pint of blood from a stranger who lives in another part of the world and not from a close relative?

Ask students to look at Worksheet 2-B. Use the following questions for discussion.

1. If you have type O blood, why are you a particularly welcome donor?
2. If you are having an operation and have type AB blood (you are the receiver), how many types of blood can your body accept?
3. Where are the world's largest concentrations of persons having AB blood? Why would this fact be important to blood technicians?

Summary: It is not enough to have adequate supplies of blood on hand at all times; it is also important to have the RIGHT TYPE of blood available. Type O blood is very valuable because it can be used on persons who have A, B, or AB blood.

Student Worksheet 2-B

Why Is Blood Typing Important?

Before a transfusion is made, the blood of both people must be carefully **typed.** Blood typing involves testing the blood for various proteins. Based on these tests, blood is grouped into one of four major types: A, B, AB, and O.

A person can safely receive only certain types of blood. Notice in the chart below what happens if a person receives the wrong type of blood. The dark areas are clumps of blood cells. They represent mismatched blood. In a person's body, the mismatched blood from the donor would clump with the receiver's blood. Huge blood clots would form and death could result. Careful blood typing prevents mismatched transfusions.

Blood type	Black	Eskimo	Northern plains American Indian	Oriental	White with European origins
O	48%	45%	23%	36%	45%
A	27%	53%	75%	28%	41%
B	21%	1%	1%	23%	10%
AB	4%	1%	1%	13%	4%

1. Human blood can be Type A, Type B, Type O, or Type AB, depending on the kinds of protein found in the blood.

2. Type AB can receive all types of blood, and Type O can receive only Type O blood.

Adapted from LeVon Balzer et al., *Life Science* (Glenview: Scott, Foresman and Co., 1983) p. 274.

Step Three: How Blood Is Processed

Performance Objectives: The students will be able to:

- *list the precautions taken by technologists to ascertain correct blood typing*
- *identify the usable parts of blood*

Materials: Duplicated copies of student worksheet 2-C "How do you know you're getting right blood?"

Development: Suppose a person who had had hepatitis gave blood, how do you suppose the blood bank could find this out and not give that blood to anyone?

Of course, there are tests for every kind of blood disease. Technologists are highly trained to label every sample and bag of a donor's blood so that it can be tested and stored accurately.

Read the material on worksheet 2-C. Underline the unfamiliar words. After the students have finished reading, ask which words were underlined, put them on the chalkboard, pronounce them, and explain them.

Use these questions for discussion:

- How many parts can blood be separated into for therapeutic use?
- Why is it so important for a hemophiliac to get transfusions of cryoprecipitate?

Summary: A donor's blood can be separated into components and can help many patients toward health.

Student Worksheet 2-C

How Do You Know You're Getting the Right Blood?

All donated blood must be processed within four to six hours.

Technologists keep detailed information sheets of test results when samples of donor and patient blood are cross-matched, and constantly recheck bag labels and records to make certain the correct samples of blood are being tested.

By separating the donor's blood into components, it is possible to give only the parts needed. One donation can benefit as many as three patients with different blood component needs.

While samples of a donated unit of blood are being tested for hepatitis and typed, the primary donor bag (still attached to the satellite bags) is sent to the components laboratory for processing.

The unit of blood is put into a large centrifuge and spun rapidly. The heavier red cells sink to the bottom of the primary bag and the plasma remains on top. Using equipment called an expressor, a technician squeezes the plasma out of the top half of the bag through sterile tubing into one of the satellite bags, so that the red cells and plasma are separated.

If platelets are to be prepared, the satellite bag containing the plasma is returned to the centrifuge and spun again. The platelets sink to the bottom of the bag and the expressor is used to remove the plasma from the platelets.

Cryoprecipitate (the inactive clotting factor VIII in persons with hemophilia A) can also be removed from plasma. The plasma is frozen quickly in an alcohol bath (chest) and then slowly thawed. Strands of a white fibrous material accumulate at the bottom of the bag. This accumulation, no larger in diameter than a quarter, is one unit of cryoprecipitate. At least ten of these units are needed for one infusion into an adult hemophiliac.

Whole blood and red cells can be stored at 4°C for only 35 days. Cryoprecipitate can be stored frozen for one year. Platelets are stored at room temperature on monitorized, agitating shelves to prevent them from clumping together. The storage period for platelet units is only five days.

Adapted from Eloise R. Giblett et al., *A Teacher's Guide to Blood Education* (Seattle: Puget Sound Blood Program) blue pp. 10.

Step Four: Blood Banks: a World Lifesaver

Performance Objectives: The students will be able to:

- *cite the contribution of Dr. Charles Drew to world blood banking*
- *explain why the development of plasma was so important during the second World War*

Materials: Duplicated copies of student worksheet 2-D "A Pioneer in Blood Banking."

Development: Sketch a simple timeline on the chalkboard. Indicate early experiments in human blood transfusion in the early part of the century.

Point out that until the second world war, it was not possible to send blood plasma overseas. This development was first motivated by a creative black surgeon. Now ask students to read about Dr. Drew silently.

Use these discussion questions to stimulate discussion: From the article, can you tell who is largely in charge of blood banking in the United States today?

Does the article tell us anything about Dr. Drew's racial background? How do you know that he was black?

Approximately how old was Dr. Drew when he died in an automobile accident? (Point out that the irony of his death is that after his accident, he was not admitted to a "white" hospital.)

Why does the American Red Cross have a portrait of Dr. Drew hanging in its national headquarters?

Summary: We all benefit from the work of scientific pioneers. People all over the world who get a blood transfusion when they need it have Dr. Drew's hard work and ingenuity to thank.

A Pioneer in Blood Banking

Every day, people who have lost blood in accidents or surgery are given life-saving transfusions. In the United States and Canada, the Red Cross collects more than six million units (half liters) of blood yearly. Much of this blood is separated into red blood cells and plasma.

Collecting blood on such a large scale is called blood banking. But until World War II, there was no organized collection of blood. Hospitals often did not have the life-saving fluid when patients needed it, so many people died.

A young man named Charles Drew helped change that. His work and writing laid the foundation for modern Red Cross blood banking in the United States.

Drew, an outstanding athlete in college, became a successful coach and teacher. But he wanted to become a doctor, so he went to medical school in Montreal, Canada. After graduating in 1933, Drew became a surgeon. While working at a New York City hospital, he wrote a paper that put together all the knowledge on blood collection from around the world.

By this time, 1940, Europe was in the middle of World War II. Drew headed a program to collect plasma in the United States to send to war-torn England.

Much of the blood being collected spoiled before it could be used. Drew learned that a cream separator, such as those used on dairy farms, could separate large amounts of plasma from red blood cells quickly. He got two separators from England and had more built in the United States. Soon, Drew's program in New York was sending the large amounts of fresh plasma overseas. A few months later, Drew set up a similar program to supply the United States armed forces with plasma. Dr. Drew went back to being a surgeon in 1941. He died in an automobile accident in 1950.

Though Drew was involved only in the start of national blood banking, his work is still remembered. His portrait, shown here, hangs in the national headquarters of the American Red Cross in Washington, D.C., where Drew was born.

From James McLaren et al., *Spaceship Earth — Life Science* (Boston: Houghton Mifflin Co., 1981) p. 217.

Step Five: Artificial blood: It Won't Replace Your Blood.

Performance Objectives: The students will be able to:

- *describe how Flusol can help in saving lives*
- *list some uses of Flusol*

Materials: Duplicated copies of student worksheet 2-E "Breakthrough: Artificial Blood."

Development: Point out that in spite of better methods of storing and shipping blood, there are still situations where the right blood cannot be obtained immediately. To keep people alive until the right type of blood can be obtained, a new scientific development has come out of Japan.

Ask students to read the article on worksheet 2-E, focusing on this question: "Will Flusol replace real human blood?"

After students have finished reading, use these questions for discussion:

- Why is Flusol not yet approved for widespread use in the United States?
- What are some of the uses of Flusol besides keeping the patient alive until real blood arrives?
- Why would Flusol be valuable if a disaster such as an earthquake took place?
- Why is it necessary to use Flusol only as a *temporary* substitute for real human blood?

Summary: Scientific developments in the knowledge of and use of blood to save lives and improve health are constantly ongoing.

Student Worksheet 2-E

Breakthrough: Artificial Blood

The howl of the siren faded as the ambulance stopped. The bleeding ranch hand was rushed into the tiny country hospital. If he could have a blood transfusion right away, he might survive. But the ranch hand's blood type was not available in that isolated area. Frantic calls were made to distant cities to try to find the blood to save his life.

A scene such as this is all too common in rural areas and developing countries. People, who might otherwise recover, sometimes die because human blood for transfusions is not available.

Help may be on the way. A team of researchers in Japan has developed an artificial blood called Flusol. It can be used as a temporary substitute for real blood. The researchers say that Flusol can keep people alive until human blood is available.

Flusol can be given to all people, regardless of the blood type. It can also be easily stored and frozen. But Flusol is not a total substitute for human blood. It does not form clots like real blood. It does not have all the chemicals of real blood. It does, however, carry the oxygen needed to keep a person alive in an emergency.

Identifying and developing Flusol took over 15 years and millions of dollars. But since 1979, when it was first tried in an emergency, Flusol has saved hundreds of lives. Flusol, however, has not yet been approved for general use in the United States. Before any medical substance, such as Flusol, is approved, it must be tested, as you see, on a large number of patients.

If Flusol is approved, it could help more than just bleeding victims. It could be useful to the victims of carbon monoxide poisoning when the blood cells cannot carry oxygen. In these cases, Flusol would carry the needed oxygen molecules.

Flusol might also help people with clogged blood vessels. Flusol's particles are much smaller than normal red blood cells, so Flusol might be able to squeeze past the clogs in the blood vessels. If it is proven safe, Flusol might provide many medical benefits.

Adapted from LeVon Balzer et al., *Life Science* (Glenview: Scott, Foresman and Co., 1983) p. 275.

LESSON 3:

Blood and Your Personal Health

Some Background Notes for the Teacher

SOME DISEASES AND CONDITIONS REQUIRING BLOOD TESTS FOR IDENTIFICATION

Specific blood tests are required for the following conditions and diseases: syphilis, anemia, sickle cell anemia, diabetes, mononucleosis, pregnancy, infection, typhoid fever, scarlet fever, diphtheria, cancer, leukemia, heart disease, and drug addiction.

SOME COMMON DISEASES DETECTED BY BLOOD TESTS

Diabetes: is a chronic disease caused by not enough insulin or deficient use of it. Its symptoms include weight loss , muscular weakness, increased thirst and hunger, impotence, and frequent urination. It results in a high concentration of glucose, a sugar in the blood. This excess glucose is excreted into the uring. Tests of urine and blood for glucose help to diagnose the disease.

Mononucleosis: is an infectious disease that is common among people from 15 to 25 years old. It is caused by a virus. Fatigue and stress seem to increase the chance of contracting this disease. Symptoms include tiredness, fever, sore throat, headache, and swollen glands. The disease is diagnosed by a blood test. Bed rest up to several weeks, and medication to ease the fever, sore throat, and headache are usually prescribed.

Syphilis: is a disease transmitted through sexual contact. It is diagnosed by a blood test. (For further information, see Family Living/Sex Education Curriculum.)

DISEASES OF THE BLOOD

Anemia: Anemia means that the blood contains an insufficient quantity of red cells. This decreased quantity can be caused by defective red cell production, increased blood loss or increased destruction of the cells.

Iron deficiency anemia:
When an insufficient amount of iron is available to the bone marrow for normal red cell production, red cell production is hampered, and those cells that are produced are pale and misshapen. Most iron deficient patients do not require transfusion and are treated by supplementary iron.

Sickle cell anemia:
In sickle cell anemia, the globin part of the hemoglobin is altered, causing the red cells to bend into a sickle shape. Because of this sickling, the diseased red cells jam the blood vessels like logs forming a jam in a river, depriving the tissues of oxygen. Eventual treatment may lie in genetic engineering.

Leukemia: This is a malignant disease that results in an overproduction of abnormal white cells. The abundance of white cells leaves little room in the bone marrow for other blood cells to be produced.

One form of treatment for leukemia is bone marrow transplantation. The bone marrow is removed from a matched donor, filtered to remove any large particles of bone, and transfused into the patient. The bone marrow cells then "find" their way to the proper places in the bones and begin to produce new blood cells. During recovery, which may be as long as four months, frequent transfusions, especially of platelets, are necessary.

Hemophilia: Hemophilia is a rare, X-linked bleeding disorder primarily affecting males (about one of every 10,000). It is caused by a deficiency of clotting factor VIII (Hemophilia A) or IX (Hemophilia B).

Hemophiliacs bleed longer but not faster than normal individuals. Most of the bleeding is into joints and muscles; the severity varies greatly. Some patients experience only occasional bleeding episodes, and in still others the disorder is so mild that bleeding occurs only after surgery or major injury. However, severe hemophilia is associated with frequent and serious hemorrhage.

Bleeding can be easily controlled with intravenous transfusions of the missing clotting factor. For hemophilia B, transfusions of plasma (which contain clotting factor IX) are used. An adult male with hemophilia A needs about 10 units of cryoprecipitate (the amount of clotting factor extracted from 10 pints of donated blood) for each transfusion. In severe cases, two to three transfusions per week are required. This means 20 to 30 blood donors may be needed *each week* for *one* hemophilia patient.

TEACHING STRATEGIES

Step One: Importance of Blood Tests in Your Personal Health Program

Performance Objectives: The students will be able to:

- *list at least seven conditions which can only be identified positively through blood tests*
- *participate in a discussion of the career opportunities for medical laboratory technicians*

Materials: Duplicated copies of student worksheet 3-A, "A Drop of Blood Tells All."

Development: Distribute worksheet 3-A and ask two volunteers to act out the scene.

After the "performance," discuss the conversation between Veronica and Tony.

- Why is Tony so happy with his job?
- What are some of the conditions that blood tests might reveal?
- How many of you have had blood tests? What did they show?
- List some symptoms which would prompt the doctor to send you to a blood laboratory (fever, fatigue, loss of appetite, recurring infection, thirst are a few).

Summary: Blood is so important in the health of every person that it can signal whenever anything is wrong. The work of the medical laboratory technician is very important to physicians in their diagnosis of disease and other conditions of the body.

Student Worksheet 3-A

A Drop of Blood Tells All

Directions: Choose two students to act out the following dialogue. The scene is a five-year high school reunion. Two old friends meet.

Veronica: Tony! I hardly recognized you. You're so sophisticated looking.

Tony: Well, how about you! Boy have you changed. What's been happening to you in five years?

Veronica: I've been working, and I've been married for the last two years. That's my husband over there talking to the principal. I'll introduce you later. But what about you?

Tony: Great. I've got a job I love and I feel like I'm really doing something important.

Veronica: I remember that you used to work part-time in the hospital.

Tony: That's where I got interested in being a medical lab technician.

Veronica: You mean you do blood tests?

Tony: Well, that's only one of the things I do. It's really exciting work. I had never realized just how much doctors depend on blood tests to help people.

Veronica: Tell me more. I'm planning to go back to school and I'm thinking along those lines.

Tony: Well, people need blood tests whenever there is reason to suspect diabetes, any kind of anemia, syphilis, mononucleosis, typhoid fever, scarlet fever, cancer, leukemia or heart disease. They're also called for with patients who might be pregnant and even for people who are drug addicted.

Veronica: Wow! That's some list, and you only took a breath once.

Tony: The nice thing about the job is that we really know we're helping people. We have to be very accurate. Suppose we made a mistake and someone was treated for the wrong disease.

Veronica: Oh, I know. Remember that time in the junior year when I was so tired? They took blood tests and found I had mononucleosis.

Tony: I'm always amazed at the things you can find out in a little drop of blood.

Veronica: Are there a lot of job openings for what you do?

Tony: Oh, sure. The field is getting bigger every day. The more new equipment they invent, the more they need good technicians.

Veronica: Listen, let's get together and talk. Tell me how hard the courses were and if you think I could handle it.

Tony: I think that's your husband waving at you.

Veronica: Oh, sure. Bob, come on over and meet Tony. He's a medical lab technician.

Step Two: Diseases of the Blood

Performance Objectives: The students will be able to:

- *participate in a discussion of blood diseases*
- *describe the transfusion needs of a severe hemophiliac*
- *recognize the need for widespread blood donations by healthy donors*

Materials: Duplicated copies of student worksheet 3-B, "Victor's Dilemma," and a blow-up of laboratory slides of diseased blood (showing sickle shapes)

Development: On the chalkboard, list the four major blood diseases (iron-deficiency anemia, sickle cell anemia, leukemia, and hemophilia). Briefly list aspects of each (using the information on pp. 25-26). Ask students to determine which is the least dangerous; which is the most dangerous. Ask students to consider how each of these diseases might affect the victim as well as the victim's family. Ask them to consider the needs of the victim of leukemia and hemophilia and to describe the implications for blood donors.

Distribute worksheet 3-B as a springboard for discussion.

Summary: Understanding the needs of victims of blood disease is everyone's responsibility. "No man is an island." Your blood could be the difference between life and death to a victim of hemophilia or leukemia.

Student Worksheet 3-B

Victor's Dilemma

Directions: Read the following dilemma and analyze what you think your own reactions would be in the situation.

Victor is 17 years old and he is very protective of his little brother Jamie. Jamie is seven years old and he has to avoid any serious injuries because he is a hemophiliac, and and accident could trigger a hemorrhage. Victor is haunted by the fact that their father died of a hemorrhage three years before when there was not enough blood available to help him survive a serious accident.

Jamie doesn't understand Victor's attitude. Jamie wants to go out on the street and play skellsies with other boys his age. Victor won't let him go. Jamie argues that he can't get hurt just kneeling down and shooting some bottle caps. Jamie says that he gets lonely staying in the house all the time, and he wants to be a regular kid.

INFORMATION ON HEMOPHILIA

Hemophilia: This is a rare hereditary (sex linked) bleeding disorder affecting males only (about one out of every 10,000). It is caused by the deficiency of a clotting factor. Hemophiliacs bleed longer but not faster than normal individuals. Intravenous transfusions of the missing clotting factor are used to stop bleeding once it starts or when given regularly prevents bleeding from occurring. This means 20-30 blood donors may be needed each week to keep a hemophiliac patient well and healthy.

Student Worksheet 3-B (continued)

On the basis of what you now know, check your reaction to these statements about "Victor's Dilemma":

	agree	disagree	don't know
Victor has good reason to be overly protective of Jamie.			
Victor has his own life to live and should not be so protective of Jamie.			
Victor should get involved in his school's blood donor campaign.			
Jamie's peers should try to visit him more often and play safe games with him.			
Jamie has to take chances in life.			
The victim of a blood disease needs lots of support from family and friends.			
There is no hope of normal relationships for Jamie.			

On the lines below, write your suggestions to Victor in solving his dilemma:

_____

_____

_____

_____

Step Three: Diseases Transmitted by the Blood

Performance Objectives: The students will be able to:

- *describe the symptoms of hepatitis*
- *describe the symptoms of acquired immune deficiency syndrome*

Materials: Duplicated copies of student worksheet 3-C, "Diseases Transmitted by the Blood," and 3-D, "Hope in the Battle Against AIDS"

Development: Ask students to read student worksheets 3-C and 3-D and answer these questions:

- Is a healthy blood donor in danger of getting hepatitis or AIDS by giving blood?
- How is hepatitis contracted?
- How is AIDS contracted?
- If it becomes apparent that a person has AIDS, does that mean that he has been involved in homosexual activities?
- Why is AIDS a dangerous disease? (It renders the victim incapable of fighting infection.)
- What is HTLV? (Human T-cell Leukemia Virus.)
- What is the function of T-cells in the body? Why is HTLV dangerous? (T-cells fight viruses and bacteriae. HTLV destroys these cells.)
- Discuss the importance of discovering a cause of AIDS. (1 — Can attempt to develop a vaccine to cure and prevent disease. 2 - NO ONE has ever recovered from AIDS.)
- What is the characteristic of HTLV that may possibly link it to AIDS? (HTLV destroys T-cells, breaking down immunities. AIDS victims have a deficient immune system.)
- What is LAV short for? Where was it identified? (Lymphadenopathy Virus. Pasteur Institute; Paris, France.)
- What is the debate between scientists over LAV and HTLV? (One side: they are dissimilar viruses. Other side: they may be one and the same virus with different names.)
- Assuming that LAV and HTLV are indeed the same virus, can you deduce any significance in this finding? (Lends more credibility to the fact that these viruses may indeed be the cause of AIDS. Thus there are increased odds for finding a vaccine to cure and prevent the spread of AIDS.)

Summary: If you are not in one of the high risk groups, you have no reason *not* to donate blood. You will **NOT** contract a blood disease by being a blood donor.

Diseases Transmitted by Blood

Directions: Read the selection and analyze the danger of these diseases.

Hepatitis: Infectious hepatitis (hepatitis A) is caused by a virus found in the stool of infected persons. It can also be spread by eating clams from areas with contaminated water; it is *not* spread by blood transfusions. Serum hepatitis (hepatitis B) is transmitted through blood transfusions. Symptoms include fever, jaundice, upset stomach, nausea, vomiting, and chronic fatigue. Persons who have had hepatitis can never be accepted as blood donors.

AIDS (Acquired Immune Deficiency Syndrome): The cause and method of spread of this disease are unknown.* Patients develop a severe deficiency of the body's defense against disease (immune mechanism), leaving the victim prey to cancer and infections. The immune problem is apparently irreversible. The syndrome can be difficult to diagnose because its early manifestations often mimic those of less serious illnesses: persistent fatigue, fever, diarrhea, night sweats, swollen glands, and weight loss. The AIDS patient may survive the first infection, or the second, but the individual remains vulnerable to successive infections, one of which is likely to kill him or her.

AIDS is a condition in which the body's normal defense mechanisms against certain diseases or conditions are reduced. As a result, patients often develop unusual infections such as Pneumocystis pneumonia, or a rare form of skin cancer, Kaposi's sarcoma. There is no known cause, preventative measure, laboratory test, or treatment for AIDS at this time—although serious research is ongoing and new aspects of the disease appear daily.*

It is known, however, that certain groups are at a high risk of contracting the disease. These include:

- those with symptoms and signs suggestive of AIDS;
- sexually active homosexual or bisexual men with multiple partners;
- sexual partners of AIDS patients;
- sexual partners of individuals at increased risk of AIDS;
- present or past abusers of intravenous drugs;
- patients with hemophilia.

There is a suggestion that AIDS may have been contracted occasionally through the transfusion of blood products. Although the majority of those in the above groups are not carriers of the disease, blood centers are recommending the voluntary refrain from donating by those who may belong to an identified high risk group. Presently there is no concrete means of detection, thus identification of those few who may be at risk is not possible.

The newspaper article (April 23, 1984) included in student worksheet 3-D discusses a finding of importance to high risk groups concerning the cure of the disease.

Student Worksheet 3-D

Hope in the Battle Against AIDS

Directions: Read the following newspaper article and discuss the questions provided by the teacher.

Doc cites virus in AIDS

News conference on cause of disease due today

Daily News, Monday, April 23, 1984

By JUDITH RANDAL

Washington (News Bureau)—Dr. Robert Gallo, head of the National Cancer Institute's Laboratory of Tumor Cell Biology, has discovered what may be the cause of AIDS (acquired immune deficiency syndrome), the deadly disease that renders its victims incapable of fighting infection.

Health and Human Services Secretary Margaret Heckler has scheduled a press conference today to announce that a new variation of a human cancer virus may be the cause of AIDS, which has taken more than 3,000 lives in the last few years.

The virus in question is the so-called human T-cell leukemia virus, or HTLV, and Gallo found it in the tissues of an AIDS patient last year. Since then, it has been found in the tissues of many other AIDS patients by several scientists. A lack of T-cells, which help the body ward off attacks by viruses and bacteria and are thought to be destroyed by HTLV, is one of the most striking features of AIDS.

Gallo has already identified two forms of the suspect virus and is expected to announce that he has now found a third form that seems to be even more closely linked to AIDS than the other two.

The discovery of the cause of AIDS is a vital step toward finding a cure, since scientists could then attempt to develop a vaccine to prevent the disease and a treatment for those who contract it. No one has ever recovered from AIDS.

But in an effort to avoid raising false hopes, Paul Van Nevel, a spokesman for the National Cancer Institute, stressed that AIDS patients should not expect any immediate benefit from the discovery, since it can take years before the identification of a virus produces practical results.

Researchers at the Pasteur Institute in Paris say that they, too, have identified a virus linked to AIDS. They call it "lymphadenopathy virus" or LAV. Some scientists say this is a different virus than HTLV, but other scientists suspect that LAV and HTLV are very closely related and may even be two names for the same thing.

From *New York Daily News*, April 23, 1984.

After Reading: Focusing on the article, compose some questions that you as a teacher might ask the class. Use these questions as part of the discussion.

Research: Appoint a committee to read and report on recent researchine field of AIDS. See Lawrence K. Altman, "AIDS and the Importation of Donated Blood." *New York Times Magazine*, Nov. 18, 1984, p. 135.

LESSON 4:

The Blood Donor as Good Citizen

Some Background Notes for the Teacher

First, donors are asked some questions about their medical history. These can include: "Is this your first donation? Have you ever had a blood transfusion? Have you ever been a patient in a hospital?"

A mini-health checkup follows. A small sample of blood is drawn from the fingertip to determine hematocrit (percentage of red cells in the blood) and also to determine the ABO blood group. These results will later be recorded on a permanent donor card along with blood pressure, temperature, pulse and Rh type.

The donor is then directed to another station where his or her name is written on a plastic donor bag containing CPD (anticoagulant-preservative). This primary bag is attached to two smaller satellite bags by tubing.

Before blood is drawn, the skin on the arm around the venipuncture site (where the needle will go) is cleaned with soap and water, alcohol and finally with iodine. The area is then sprayed with a super-coolant called ethyl chloride, a liquid which evaporates quickly and gives the illusion of "freezing" the skin to make needle insertion relatively painless. The donor then squeezes a roll of cloth to keep the blood flowing into the primary donor bag.

The primary plastic bag is hung on a scale calibrated for the weight of one pint of blood. The needle is removed, the donor's arm raised, and pressure is put on the venipuncture site to start clot formation. Finally, a band-aid is applied. The entire procedure takes between six and eight minutes.

Donors are then served juice and hot drinks plus crackers and cookies in the canteen.

The body replaces the blood volume (as plasma) in about 24 hours. The red cells are replaced in three to four weeks. Normal healthy donors may safely give one pint of blood as often as five times a year.

Adapted from Eloise R. Giblett et al., *A Teacher's Guide to Blood Education* (Seattle: Puget Sound Blood Program) blue p. 9.

TEACHING STRATEGIES

Step One: Who Is Eligible to Give Blood?

Performance Objectives: The students will be able to:

- *list at least ten conditions which prevent a donor from giving blood*
- *recognize that most high school seniors are healthy donors*

Materials: Duplicated copies of student worksheet 4-A, "Guidelines for Potential Blood Donors."

Development: Ask class by show of hands how many think they would be acceptable blood donors. (Point out that only three to six percent of the eligible blood donors give blood.)

How would you know if you were not a good blood donor? Canvass class for some guesses at conditions which would preclude donation.

Distribute student worksheet 4-A. Ask students to count the number of conditions which would render a person permanently unable to give blood. (Answer: five.) How many of the other conditions are likely to turn up in the life of a normal, healthy 18 year old? (Sore throat, allergies, minor surgery, tattoos, etc.).

Ask students to guess why 94-97% of eligible donors *never* give blood. Estimate how many of these non-donors will need a blood transfusion at some time in their lives. Make a chart in which numbers of actual blood donors are superimposed on numbers of persons who will need blood in their lifetime.

Brainstorm the reasons healthy people do not give blood. (Fear of needles? Fear of fainting? Selfishness? Superstitious? Laziness? Religion?) Make a list of common fears about donating blood, such as:

- It hurts.
- It will make me sick and faint.
- I will have to curtail my activities after donating blood.
- I will be susceptible to infections afterwards.
- It will destroy important brain cells.
- It will cause sexual impotence.

Summary: Draw class to conclusion that there are really very few factors which might prevent the average high school senior from helping others by giving blood.

Student Worksheet 4-A

Guidelines for Potential Blood Donors

In order to donate blood, you must be over 17 and under 66 years of age.* You must weigh over 110 pounds, and your last donation should have been more than 56 days ago.

The following guidelines have been prepared by the Greater New York Blood Program so that you can know who is eligible to donate blood.

If the condition for postponement is temporary, the technician will mark this on your pledge card along with the reason, so that you can be contacted at the appropriate time.

If there are any doubts, you will be asked to sign up and let the experts who do the medical screening make the decisions.

CONDITION	LENGTH OF POSTPONEMENT
Abortion (miscarriage)	Six weeks
Active Allergies symptoms on day of donation	Until symptom free
Acute Cough, Sore Throat, Sinusitis	Until symptoms have subsided and temperature is normal
Antibiotics (oral)	Two days
Asthma	Two months after last attack
Blood Transfusion	Six months
Cancer (except localized skin cancer)	Permanent
Chronic Kidney Disease	Permanent
Diabetes	While taking insulin
Epilepsy, Convulsions, or Repeated Fainting Spells	Permanent
Full Term Pregnancy	Six months after delivery
Heart Disease — Active Symptoms	Permanent
Hepatitis	Permanent
Hepatitis (contact with patient)	Six months
Inderal (drug for high blood pressure)	Six months
Localized Skin Cancer — removed	Six months after removal
Malaria	Three years after last attack or treatment**
Malaria Area *with* antimalaria drugs	Three years after drug is stopped**
Malaria Area *without* antimalaria drugs	Six months**
Major Surgery	Six months
Minor Surgery	Six weeks
Mononucleosis	Until returned to work or school
Open Heart Surgery	Three years
Pregnancy	Cannot donate
Skin Rash or Infection (area on arm where needle is inserted	Until rash or infection is clear
Surgery	Six months if required transfusion
Tattoos, Acupuncture, Ears or Nose Pierced	Six months, except if done in doctor's office with sterile equipment
Tooth Extraction	Three days
Tuberculosis	Two years after full recovery
Vaccinations	
a. Small Pox	Two weeks
b. Yellow Fever	Two weeks
c. Oral Polio	Two weeks
d. Mumps	Two weeks
e. Tetanus	Three days
f. Measles	Must ask at blood center

* Persons 66 years of age and older may be accepted provided they present a letter from their physician indicating it is safe for them to donate. (Dated within two weeks of donation date.)

** During this period your blood may not be used for regular transfusions. However, your plasma may still be used to prepare life-saving derivatives (e.g., factor VIII for hemophiliacs). If you wish to donate for this purpose, please tell the nurse, and we will collect your blood for special processing.

Adapted from the Greater New York Blood Program.

Step Two: Giving Blood the First Time — What to Expect

Step Three: Where and When to Give Blood

Performance Objectives: The students will be able to:

- *fill out blood donor information form*
- *identify nearest blood donor site*

Materials: Copies of Red Cross Form for each student. Duplicated copies of student worksheet 4-B, "What Can You Expect When You Give Blood?" Film *Those Who Know . . . Those Who Don't,* The Greater New York Blood Program, American Red Cross, 16mm, 10min., color. Free loan.

Development: Distribute student worksheet 4-B. Ask students to read silently. Then ask for three volunteers to role play the blood donation experience based on their reading. (One to be the technician, one to be the person who takes the information, and one to be the donor.)

Then ask students to fill out Red Cross forms, explaining the reasons for the various questions.

When forms are finished, put address of nearest site on chalkboard.

Summary: What are we waiting for?

Student Worksheet 4-B

What You Can Expect When You Give Blood

If you've never given blood, here's what you can expect to happen when you donate blood.

First, you register, furnishing such basic information as your name, address, age, and so on.

Next, a medical history is taken to reveal any circumstances or conditions that might affect your eligibility as a donor. Then, a drop of blood from your finger is analyzed, and your pulse, blood pressure, and temperature are checked. Finally, a qualified person reviews all this data and decides if you are an eligible donor or not.

Assuming there's nothing to prevent you from giving blood, you are then asked to lie on a bed or in a contour chair. Before blood is drawn, the skin on the arm around the venipuncture site (where the needle will go) is cleaned with soap and water, alcohol and finally with iodine. The area is then sprayed with a super-coolant called ethyl chloride, a liquid which evaporates quickly and gives the illusion of "freezing" the skin to make needle insertion relatively painless. The donor then squeezes a roll of cloth to keep the blood flowing into the primary donor bag. Giving the pint of blood feels about the same as having blood taken from your arm for a blood test, and the procedure takes only five to ten minutes. Afterward, you'll rest a short while, have a cup of coffee or some fruit juice if you want, and then you're on your way, feeling good about the experience and ready to resume your usual activities.

Your body doesn't miss the blood for long. Within 24 hours, the normal volume of blood—about ten to twelve pints—is restored. However, it does take about five weeks for all the red cells to be replaced, and that's why you can donate blood only every eight weeks or five times a year.

Dated _____ Signature of Donor _____

I hereby grant permission to the New York Blood Center to draw approximately one pint of blood from me to be used for the treatment of patients or for biomedical research as it may deem desirable. The medical history which I have furnished is true and accurate, to the best of my knowledge.

History and Examination

	Yes	No		Yes	No
01 Are You in good health?			15 Diabetes		
02 Previous rejection medical reason			16 Lymph Gland Disease Cancer		
03 Resp. infection now, cold, grippe, flu			17 Kidney Disease		
04 Yellow jaundice, hepatitis			18 Prolonged Fever, Rheumatic Fever		
05 Exp. to jaundice or hepatitis last 6 mos.			19 Allergy, Asthma, Hay Fever, Now		
06 Recd. blood plasma, serum, tatto last 6 mos.			20 Fainting, Convulsions, Epilepsy		
07 Malaria			21 Skin Infection		
08 Suppressive therapy for malaria			22 Tooth Extraction within 72 hours		
09 Resid. outside U.S. within 6 mos.			23 Immunizations or Vaccinations Past Year		
10 Pregnancy last 6 mos.			24 Immunized to Human Blood Cell Antigens		
11 Heart trouble			25 Medications or Drugs Past 6 mos.		
12 Surgery or serious injury			26 Recent unexplained Weight Loss		
13 Tuberculosis, cough blood			27 Exposure to Infectious Disease		
14 Chest pain, shortness of breath			28 Arm Inspection		

Remarks _____

Pulse	Temperature	Hemoglobin	Hematocrit	Blood Pressure	Weight	Remarks

Signature of MD or RN _____

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THE GREATER NEW YORK BLOOD PROGRAM

New York Blood Center / American Red Cross

NEW YORK BLOOD SERVICES / LONG ISLAND BLOOD SERVICES / NEW JERSEY BLOOD SERVICES / HUDSON VALLEY BLOOD SERVICES

Please print or type-write on hard smooth surface—use black ball point pen

Donation date | Site zip | Division: ☐ N.Y. ☐ N.J. ☐ I.C. ☐ H.V. Site: ☐ center ☐ mobile ☐ other | Place unit number sticker here

DONOR

Last name (Print or Type) | Full first name | Init | Birthdate | Sex

Street address | City | State

Zip code | Home tel. (area code & no.) | Bus. tel. (area code & no.) | Soc. Sec. or Badge No. | Last donation date

Would you like to be an emergency ON-CALL donor? ☐ Yes ☐ No

Was donor called for this donation? ☐ Yes ☐ No

Donor age | Blood type | Registrar

GROUP

Donor Group ☐ | Group no: | Group name | Family plan ☐ | Blue Cross coverage? ☐ Yes ☐ No

Subs. Donor ☐ | Credited person's last name | Credited person's first name

Repl. Donor ☐ | Patient's name (last) | (first) | Hospital | City | State

Remarks:

COLLECTION (blood program medical staff only)

Bag type ☐ S ☐ M ☐ Other_____

Unit deferral code ☐ nc ☐ co

Fraction codes ☐ ML (malaria) ☐ FR (other)

Component codes

Special collection:

☐ FZ (to be frozen) ☐ HN (heparin) ☐ RS (research) ☐ TH (therapeutic) ☐ L1 (single plasma pheresis) ☐ L2 (double plasma pheresis) ☐ PP (manual platelet pheresis) ☐ Other_____

Amount drawn | Time: (begin / end / elapsed) | Lot number | Phlebotomist:

Remarks: (include Blood Bank Affiliate name)

COPY 1 DONOR HISTORY

over

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LESSON 5:

Increasing Blood Donations

Some Background Notes for the Teacher

More than 2,200 pints of blood are needed everyday for patients in 262 metropolitan area hospitals. Only 2.9% of the Greater New York population donate blood. This meets about two-thirds of our needs. Approximately one-third of the blood used in the New York/New Jersey area is collected in Europe because not enough New Yorkers donate regularly. The supply of blood becomes critically low during holidays and vacation times. One out of every ten people entering the hospital needs blood. The three main categories of blood usage are: surgery patients, victims of accidents, and persons with chronic illnesses.

Forty-five percent of blood is composed of red cells, white cells, and platelets. Plasma makes up 55% of blood. Because of advances in medical technology, each pint of blood can be used to treat several people. A single donation can be divided into red blood cells that are used to treat anemia or for open heart surgery; white blood cells, used to treat leukemia and for clinical trials using interferon to combat cancer; platelets are used to control bleeding and are essential for patients undergoing chemotherapy; plasma is used in treating hepatitis, is the source for the clotting factor for hemophiliacs, and it is used by victims of shock and burns.

Then you will need a lot of ideas. Below are some suggestions which you may want to use in your teaching strategy. They are borrowed and adapted from other school districts throughout the country. Use them as is, or as pump primers to create your own ideas.

PROMOTIONAL IDEAS

Following are ideas and tools that have worked for other high schools and which you may wish to adapt.

Sign up new donors by using the chicken campaign. The purpose of the campaign is not to brand anyone as cowardly, but to encourage students to laugh about and discuss their fears.

Invite parents and teachers to donate.

Create competition among groups: football team vs. basketball team, senior vs. faculty, etc.

Place windshield notices on cars in the school parking lot.

Decorate the donation site to make it cheerful, pleasant and even fun and ask one of the school's musical groups to entertain in the canteen.

Branch Out to Others — Large tree with leaves for names of donors. This could be a cardboard or paper display or an actual branch stuck in a pot of sand.

Light a Life—Save a Life — A tree strung with small clear light bulbs is used. For each donor who pledges to give blood, a light goes on. When the goal is reached, the entire tree is lit.

Fill Up Phillip — A cardboard man named Phillip with sections divided and colored in to indicate how many people have pledged to donate. The purpose is to color the man and "fill up Phillip."

Thermometer — The thermometer is divided into sections indicating percentages, and is filled in to indicate how much progress is being made toward reaching the goal.

Be A Link to Life — Use paper chains with a donor's name on each link. Place this paper chain in a prominent place.

Don't Be Chicken—Give Blood — A large chicken resting on a nest of eggs; each egg has a donor's name on it.

Don't Be A Turkey—Give Blood! — Use a turkey with a feather for each donor stuck in its back. The theme can revolve around Thanksgiving.

Take A Break—Give Blood — A large bouncing ball is used in the center of the display, with names of donors on little balls. Or use a beach ball that can be autographed by donors.

I Vant Your Blood — A vampire theme, especially good for Halloween time bloodmobiles. A vampire is in the middle of the poster board with names of donors on little bats.

Do You Know These Blood Donors? — Baby photographs of people who have pledged to donate. Names of babies on the bottom.

Valentine's Day

A. "Give a Life for Valentine's Day"
A large heart with names of donors on small hearts.

B. "Be a Sweetheart — Be a Blood Donor"
Cupid in the middle, small hearts with donors' names to indicate those who have pledged.

Those Who Care Have a Pint to Spare! — Names of donors printed on small blood pouches.

We're Building Something Great! But We Need More Blocks! — A building of blocks is being constructed — names on square blocks.

Give a Bunch of Corpuscles!

Make Someone Happy! — A large smiling face is the main focus. Scattered around it are small smiling faces printed with donor's names. At the bottom print, "Look who's making patients happy . . . these people are!"

These ideas have really helped some groups who have needed a boost. Why not try to develop your own. Put the display in a prominent place and watch the pledges come in!

*From The Missouri/Illinois Regional Red Cross Blood Services, American Red Cross.

RECOGNITION

Saying "thanks" for a job well done is very important. Donors are very proud of themselves for having given blood and want to be appreciated. You must treat them as very special people—because they are!

Another reason for recognition is that you want them to donate again. This will happen *if* they feel they were appreciated the first time. So tell your donors they have played an important role—the unit of blood that they have donated will help as many as three patients.

The New York City Board of Education is making every effort to show appreciation for blood donors. For example, they recently sponsored a very special evening of recognition with the New York Mets baseball team. Eight thousand blood donors were the guests of the Mets for the game against the Pittsburgh Pirates. Schools Chancellor Nathan Quinones threw out the first ball and congratulated all the participants. The privileged guests received a special thrill when the names of the five city high schools who were tops in blood donations were flashed on Diamond Vision and recognized over the public address system. New York Blood Services awarded Certificates of Appreciation to each donor. This was only one of many ways New York City demonstrates its encouragement for blood donors.

Some other ideas for recognition are listed below:

Put each donor's name in the school newspaper. Include "thanks" also to those who signed up to donate but were deferred.

Send official classes a "thank you" card to those who donated.

Have crayon and paper available in the canteen. Ask donors to draw their feelings about giving blood and have a poster contest. Then publish the winning poster in the school newspaper. All posters could be sent to the Blood Center for display in the Donor Drawing Room.

Establish a Blood Donor Honor Roll.

Certificate of Appreciation

1983-84 HIGH SCHOOL RECOGNITION PROGRAM

This Certificate is awarded to

_____

in appreciation for donating blood during the 1983-84 High School Blood Donor Recruitment Campaign and for sharing in one of the greatest acts of community and social responsibility.

Dr. Vijayalaxmi Malavade, M.D.
Director, New York Blood Services

Nathan Quinones
Acting Chancellor

TEACHING STRATEGIES

Step One: Visualizing the Need for Blood Donations

Performance Objectives: The students will be able to:

- *create visuals (pie charts, graphics, cartoons) to maximize impact of blood statistics*
- *roleplay a "Madison Avenue Simulation Game"*

Materials: Student worksheet 5-A "A Little Blood Goes a Long Way"

Development: Read students the second paragraph of "Background Notes for the Teacher." Ask questions to see how much information they retained. Suggested questions are:

- How much of your blood is plasma?
- What part of the blood is used to treat anemia?
- What part of the blood is needed to treat burn victims.

Now distribute student worksheet 5-A and focus on the pie chart. Ask the same questions again. Responses should be much quicker. Point out the importance of visuals in making a point.

Now ask students to imagine themselves employed by an advertising agency assigned to develop a campaign to increase the number of blood donations. Set up teams of four or five students to represent different departments of the agency. Each department has to answer a specific problem related to the total campaign.

1. Think-tank team	What should our overall concept be? What theme should run through the whole campaign — altruism, need, payback? Brainstorm.
2. Copywriting	What kind of slogan and overall verbal appeal will attract donors from our target group? Should we have one slogan which recurs in print and electronic media?
3. Graphics	What sort of visuals can we create to make the need for blood seem more acute?
4. Public relations	What special events can we plan on a local level to highlight importance of and ease of blood donations.
5. Time buying (media)	How can we best use our media resources (paid and free) to reach our target audience?

Ask each committee to report back results of its brainstorming session.

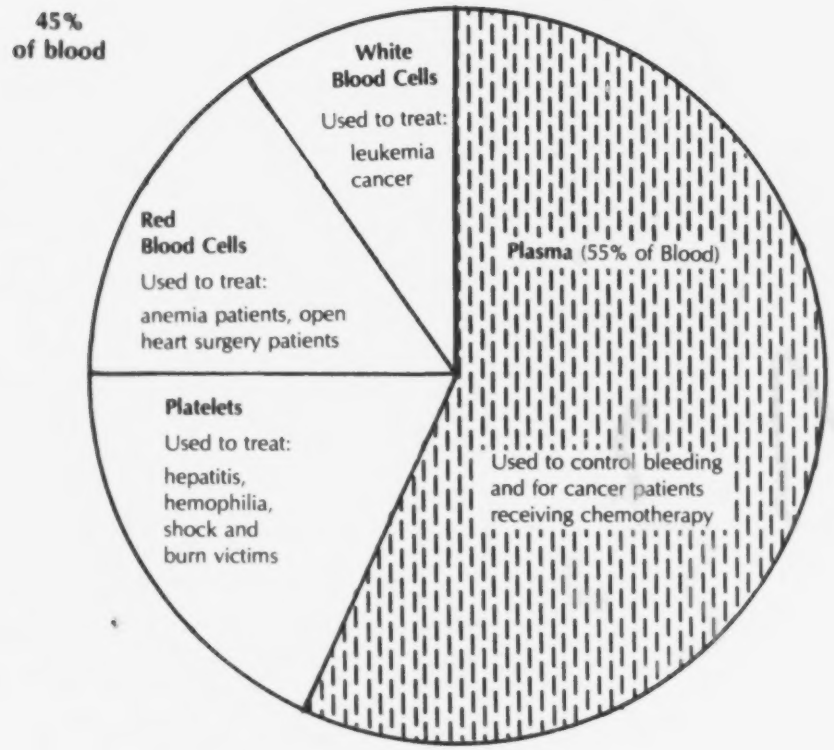
Summary: Are we ready to launch a blood donor campaign here at our high school? Adapt "Madison Avenue Simulation" results to real life.

Student Worksheet 5-A

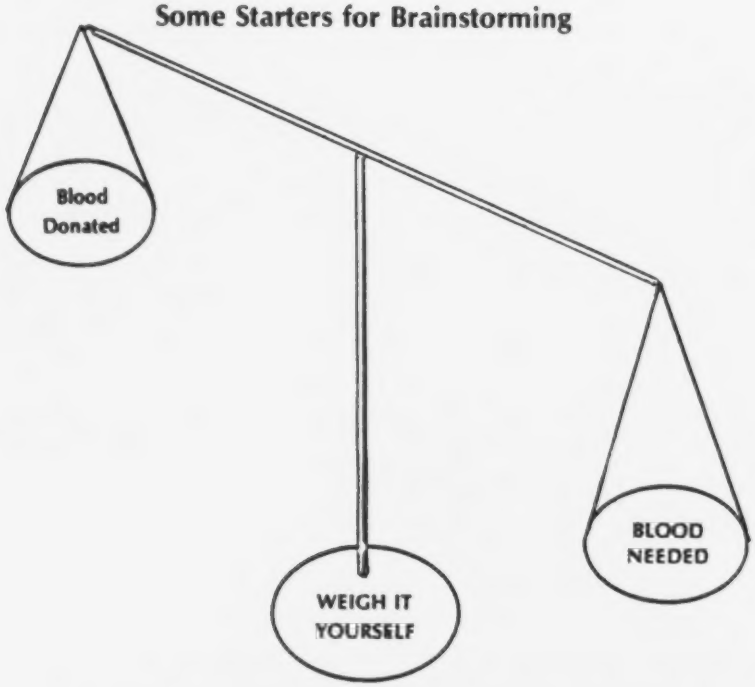
A Little Blood Goes a Long Way

Directions: Using the pie chart below, answer the teacher's questions.

A SINGLE BLOOD DONATION



Some Starters for Brainstorming



NEW YORK CITY METROPOLITAN AREA

TARGET AUDIENCE	**CHARACTERISTICS OF THE AUDIENCE**
HS Seniors?	_____
College Students?	_____
Parents?	_____
School Employees	_____

How will the outcome of the campaign be measured?

a. Increased blood donations?

b. Knowledge about blood? Knowledge about uses of blood donations?

c. Need for blood donations?

d How will you reach your audience?

e. Which means of communication is more effective for your audience?

f. Which issues should be addressed?

g. Which issues will get the best results?

Student Worksheet 5-A (continued)

Now let's see if you can invent a visual or graphic of your own to get across some important blood facts.

Use the visual below to make these facts more easily understood.

Suppose this class represented an advertising firm that was given the job of creating an advertising campaign to increase the number of blood donations.

What are the facts you would need to know?

There are:

1. 2,200 pints of blood needed every day.
2. 262 hospitals in the New York Metropolitan Area.
3. Two-thirds of the blood need is supplied by private donation.
4. 2.9% of the total population donate blood.
5. One out of every ten people entering the hospital needs blood.
6. One-third of our blood is supplied by Europe.

Step Two: Planning a real blood donor campaign in your school

Performance Objectives: The students will be able to:

- *make specific suggestions for school's blood donor campaign*
- *identify key members of student body and professional staff whose cooperation would be needed for such a campaign*

Materials: A box with folded up slips bearing promotional ideas. (You may call it the fortune cookie box.) Student worksheet 5-B, article from *New York Daily News.*

Development: Ask students to pick at random slips of paper from your fortune cookie box. (You can make the slips from the ideas given in the "Background Notes for Teacher—or you can make up your own—or combine both.) Ask students to read their slips quietly and formulate a reaction before speaking. First ask those students to speak who feel they pulled "workable" idea slips. Then ask for comments from those students whose slips seem unworkable or unsuitable to your school.

Now distribute student worksheet 5-B and ask students to read about the blood donations program at Madison High School. What does Madison have that we don't have?

As a group develop a time line for your school's blood donor program.

1. Pinpoint key people who should be involved: principal, school nurse, Assistant Principal of Physical Education, Coordinator of Student Activities, Student body president, captains of teams, newspaper editor. (Ask individuals to explain importance of involvement of each of these people.)

2. Develop an eight-week timeline to be worked out by your committee. Below is a sample adapted from the Puget Sound Teaching Materials.

Student Worksheet 5-B

Students Give Blood

By CHARLES SEATON

. . . The seniors of James Madison High School filled the auditorium to give blood and meet the mayor.

When Koch initiated a question-and-answer session, with the students, one of them, Donna Kerrigan, 17, reminded him to aid education in the city.

"After all," she told the mayor, "we'll be voting next year."

Another student, Lynda Sayer, told hizzoner, "I definitely think giving blood is a good idea because you never know when you or someone in your family might need blood in an emergency situation."

Then the students lined up on the auditorium stage to donate blood.

"Our football team is No. 1 team in the city," said Madison senior Alex Andradi. "We're doing this because its the right thing to do."

After the mayor left, Madison Student Union President Steven Shuller said, "If we can save one life, it's worth rolling up our sleeves. We're showing the type of school James Madison is."

The blood donations will benefit the Greater New York Blood Program which supplies blood for 262 hospitals in the metropolitan area. The hospitals need 2,200 pints a day.

Each pint donated has the potential for being fractioned into five units of transfusable material.

Last year, 80 of the city's 110 public high schools participated in the blood campaign, nearly double the number for 1982.

"More than 21,000 city employes and high school kids have given blood," said Koch. "We have to give more credit to the high schools kids."

From *New York Daily News*, March 6, 1984.

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Student Worksheet 5-C

An 8-Week Guideline

BEFORE THE BLOOD DRIVE

4 — 8 weeks:

- Plan your campaign theme and decorations with your committee.
- Check with art department, music department and journalism classes and enlist their aid.
- Contact representative from the Greater New York Blood Bank for a special assembly.
- Check local newspaper deadlines for submitted articles.

3 — 4 weeks:

- Make appropriate signs, banners and decorations.
- Write and/or submit articles to school newspaper.

2 — 3 weeks:

- Put up posters.
- Have articles published in school newspaper.

3 — 7 days:

- Begin PA announcements reminding students.
- Call donors to remind them of their donation appointments.

DAY OF DRIVE

- Remind each donor of appointment.
- Give list of donors to appropriate teachers.

AFTER THE DRIVE

- Thank each donor.
- Carry out previously decided methods of recognition.

Summary: Why should our school have a blood donor campaign? When should it start? Who's going to organize it? How should we evaluate success?

The answers are up to **YOU . . . the Blood Donor!**